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过渡内蕴模态函数对经验模态分解去噪结果的影响研究及改进算法

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Study of the influence of transition IMF on EMD do-noising and the improved algorithm

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摘要

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摘要

经验模态分解(Empirical Mode Decomposition, EMD)是一种具有较大应用潜力的去噪算法.目前,该算法存在的一个较大问题是过渡内蕴模态函数(Intrinsic Mode Function, IMF)中混叠噪声不能有效处理.过渡内蕴模态函数中混叠噪声不易剔除,限制了该算法的应用.本文针对此问题,通过研究过渡IMF的特点,首次提出一种有效去除过渡IMF中混叠噪声的方法.该方法首先对原信号进行一次EMD处理,得到包含过渡IMF的初步去噪结果,并将其与合适的余弦信号结合,改变其包络分布,然后对其结果再次进行EMD处理,仿真实验表明该方法在保留有效信号的同时,可以有效的去除过渡IMF中混叠的噪声,并将该方法用于实际地震资料随机噪声压制,处理效果令人满意.

关键词 地震信号处理, 经验模态分解, 余弦函数, 内蕴模态函数, 过渡内蕴模态函数

Abstract:

The Empirical Mode Decomposition is a good method of do-noising which has great application potential. The existing do-noising methods based on EMD (Empirical Mode Decomposition) cannot effectively deal with the transition IMF (Intrinsic Mode Function) from the EMD of the original signal. Because of the noise aliasing in the transition IMF cannot be easily removed, the application of EMD in do-noising is limited. To solve this problem this paper studied the influence of transition IMF on EMD do-noising result, and proposes a method to remove the noise aliasing in the transition IMF. The envelope structure of inchoate do-noising results processed by single EMD would be changed with an opportune cosine signals, then the signal received is decomposed again by EMD and the noise aliasing in the transition IMF is removed. The do-noising results of analog signal show that it can effectively keep the useful signal and remove the noise aliasing in the transition IMF. Using this method to do-noise the actual seismic signal, it can suppress random noise and improve the SNR (signal to noise ratio) of seismic signal.

Keywords [Seismic signal processing](#), [Empirical mode decomposition](#), [Cosine function](#), [Intrinsic mode function](#), [Transition intrinsic mode function](#)

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